SUBSECTION 8.6

Public Health

8.6 Public Health

This section presents an assessment of risks to human health potentially associated with operation of the proposed facility, focusing on chemical pollutants that could be emitted or released. Air pollutants for which California Ambient Air Quality Standards (CAAQS) or National Ambient Air Quality Standards (NAAQS) have been established are also addressed in Section 8.1 of this document.

The principal concerns for public health are associated with emissions of chemical substances to the air during routine operation of the proposed facility. Chemicals substances in air that potentially pose risks to human health include byproducts from the combustion of natural gas. These chemical substances, which were addressed in a health risk assessment, included:

- Acetaldehyde
- Acrolein
- Benzene
- Formaldehyde
- Toluene
- Xylene

Combustion byproducts with established CAAQS or NAAQS, including oxides of nitrogen (NO_x), carbon monoxide and fine particulate matter are addressed in the Ambient Air Quality section (see Section 8.1.3). However, some discussion of the potential health risks associated with these substances is presented in this section. Human health risks potentially associated with accidental releases of stored acutely hazardous materials at the proposed facility (anhydrous ammonia) are also discussed in this section.

8.6.1 Laws, Ordinances, Regulations, and Standards

An overview of the regulatory process for public health issues is presented in this section. The relevant LORS that affect public health and are applicable to this project are identified in Table 8.6-1. Table 8.6-1 also summarizes the primary agencies responsible for public health, as well as the general category of the public health concern regulated by each of these agencies. The conformity of the project to each of the LORS applicable to public health is also presented in this table, as well as references to the locations where each of these issues is addressed. Points of contact with the primary agencies responsible for public health are identified in Table 8.6-2.

TABLE 8.6-1
Summary of Primary Regulatory Jurisdiction for Public Health

LORS	Public Health Concern	Primary Regulatory Agency	Project Conformance
Clean Air Act	Public exposure to air pollutants	USEPA Region IX CARB SJVUAPCD	Based on results of risk assessment as per CAPCOA guidelines, toxic contaminants do not exceed acceptable levels (see Section 8.6.3.2). Emissions of criteria pollutants will be minimized by applying BACT to the facility. Increases in emissions of criteria pollutants will be fully offset (Section 8.6.4.1).

TABLE 8.6-1
Summary of Primary Regulatory Jurisdiction for Public Health

LORS	Public Health Concern	Primary Regulatory Agency	Project Conformance
Health and Safety Code 25249.5 et seq. (Safe Drinking Water and Toxic Enforcement Act of 1986—Proposition 65)	Public exposure to chemicals known to cause cancer or reproductive toxicity	Office of Environmental Health and Hazard Assessment (OEHHA)	Based on results of risk assessment as per CAPCOA guidelines, toxic contaminants do not exceed thresholds that require exposure warnings (see Section 8.6.3.2).
40 CFR Part 68 (Risk Management Plan)	Public exposure to acutely hazardous materials	USEPA Region IX Fresno County Office of Emergency Services (OES)	A vulnerability analysis will be performed to assess potential risks from a spill or rupture of the aqueous ammonia storage tank (see Section 8.6.3.3). An RMP will be prepared prior to commencement of facility operations (see Section 8.6.4.3).
Health and Safety Code Sections 25531 to 25541	Public exposure to acutely hazardous materials	Fresno County Office of Emergency Services (OES) CARB SJVUAPCD	A vulnerability analysis will be performed to assess potential risks from a spill or rupture of the aqueous ammonia storage tank. (see Section 8.6.3.3)
Health and Safety Code Sections 44360 to 44366 (Air Toxics “Hot Spots” Information and Assessment Act—AB 2588)	Public exposure to toxic air contaminants	CARB SJVUAPCD	Based on results of risk assessment as per CAPCOA guidelines, toxic contaminants do not exceed acceptable levels (see Section 8.6.3.2).

TABLE 8.6-2
Summary of Agency Contacts for Public Health

LORS	Public Health Concern	Primary Regulatory Agency	Regulatory Contact
Clean Air Act	Public exposure to air pollutants	USEPA Region IX CARB SJVUAPCD	Gerardo Rios, 916-744-1259 Mike Tollstrup, 916-322-6026 Sayed Sadredin, 559-230-6000
Health and Safety Code 25249.5 et seq. (Safe Drinking Water and Toxic Enforcement Act of 1986—Proposition 65)	Public exposure to chemicals known to cause cancer or reproductive toxicity	Office of Environmental Health and Hazard Assessment (OEHHA)	Cynthia Oshita or Susan Long, 916-445-6900
40 CFR Part 68 (Risk Management Plan)	Public exposure to acutely hazardous materials	USEPA Region IX" Fresno County Environmental Health Department	Gerardo Rios, 916-744-1259 Harry Yee, 559-445-3271
Health and Safety Code Sections 25531 to 25541	Public exposure to acutely hazardous materials	Fresno County Environmental Health Department) SJVUAPCD	Harry Yee, 559-445-3271 Sayed Sadredin, 559-230-6000

TABLE 8.6-2
Summary of Agency Contacts for Public Health

LORS	Public Health Concern	Primary Regulatory Agency	Regulatory Contact
Health and Safety Code Sections 44360 to 44366 (Air Toxics "Hot Spots" Information and Assessment Act—AB 2588)	Public exposure to toxic air contaminants	CARB	Mike Tollstrup, 916-322-6026
		SJVUAPCD	Sayed Sadredin, 559-230-6000

8.6.2 Affected Environment

The Central Valley Energy Center (CVEC) will be a 1,060-megawatt (MW) net combined-cycle generating facility configured using three natural-gas-fired turbines and one stream turbine. The site is located in unincorporated Fresno County. The CVEC will connect to PG&E's electrical transmission system via PG&E's Panoche – McCall and Panoche – Kearney 230-kV transmission lines, which are located on a parcel to the south of the project site. Natural gas for the facility will be delivered via approximately 20 miles of new 24-inch pipeline that will connect to Pacific Gas and Electric's (PG&E) existing gas transmission line (Line 2) located to the west of the project site. Roughly 7,000 acre-feet per year (afy) of reclaimed water for cooling tower and process makeup water will be supplied by Fresno-Clovis Wastewater Treatment Facility (WWTF) via a 21-miles of 27-inch pipeline.

The site (see Figure 1.1-2) is located on an 85-acre parcel in the southeastern portion of the City of San Joaquin near the north intersection of Springfield Avenue and Placer Avenue. The site is bounded to the north and east by West Colorado Avenue and Union Pacific railroad corridor. Urbanized uses in the City are generally located to the north and west of the site. Rural residential uses are located to the west of the site. Existing uses on the site include irrigated agriculture, power lines and an irrigation canal. Most of the site is used to grow cotton, is surface irrigated and does not involve special cultivation practices. A small portion on the northern side of the site is used for heavy commercial/light industrial uses. There are few sensitive receptor facilities (such as schools, daycare facilities, convalescent centers, or hospitals) in the vicinity of the project site.

The nearest sensitive receptor is an elementary school located just under 1.0 mile north of the project site. There are also a few residences (primarily farmers) in the vicinity of the site. Sensitive receptors within a 3-mile radius of the project site are shown on Figure 8.6-1. Further description of sensitive receptors within a 3-mile radius of the project site is presented in the hazardous materials section, Section 8.12.

A database search of available health studies for a 6-mile radius around the City of San Joaquin did not produce any such studies. However, Figure 8.6-2 identifies sources of environmental pollution shown by USEPA's EnviroMapper database[1] for a 6-mile area surrounding the CVEC site.

The terrain within a 10-mile radius of the Project is provided under separate cover on 7.5-minute USGS Quad maps, five sets of which have been submitted to the California Energy Commission. Figure 8.6-3 provides an index of the 7.5-minute Quad maps within the CVEC vicinity.

[1] http://www.epa.gov/epahome/commsearch.htm

8.6.3 Environmental Consequences

Environmental consequences potentially associated with the project are potential human exposure to chemical substances emitted into the air. The human health risks potentially associated with these chemical substances were evaluated in a health risk assessment. The chemical substances potentially emitted to the air from the proposed facility include ammonia, volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs) from the combustion turbines and auxiliary boiler, and ammonia and trace metals from the cooling tower. These chemical substances are listed in Table 8.6-3.

8.6.3.1 Criteria Pollutants

Emissions of criteria pollutants will adhere to NAAQS or CAAQS as discussed in the Ambient Air Quality section (see Section 8.1.4). The proposed facility also will include emission control technologies necessary to meet the required emission standards specified for criteria pollutants under San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) rules. Offsets will be required for emissions of criteria pollutants that exceed specified thresholds, to assure that the project will not result in an increase in total emissions in the vicinity. Finally, air dispersion modeling results (presented in the Ambient Air Quality section, Section 8.1.5.1.2) show that emissions will not result in concentrations of criteria pollutants in air that exceed ambient air quality standards (either NAAQS or CAAQS). These standards are intended to protect the general public with a wide margin of safety. Therefore, the project is not anticipated to have a significant impact on public health from emissions of criteria pollutants.

8.6.3.2 Toxic Pollutants

Potential impacts associated with emissions of toxic pollutants to the air from the proposed facility were addressed in a health risk assessment, presented in Appendix 8.1C. The risk assessment was prepared using guidelines developed under the AB 2588 Air Toxics "Hot Spots" Information and Assessment Act (California Air Pollution Control Officers Association [CAPCOA], 1993).

TABLE 8.6-3
Chemical Substances Potentially Emitted to the Air from CVEC

Criteria Pollutants	**Noncriteria Pollutants (Continued)**
Carbon monoxide	Polycyclic aromatic hydrocarbons (PAHs)
Oxides of nitrogen	Benzo(a)anthracene
Particulate matter	Benzo(a)pyrene
Noncriteria Pollutants (Toxic Pollutants)	Benzo(b)fluoranthene
Ammonia	Benzo(k)fluoranthene
Acetaldehyde	Chrysene
Acrolein	Dibenz(a,h)anthracene
1,3-Butadiene	Indeno(1,2,3-cd)pyrene
Benzene	Naphthalene
Ethylbenzene	Arsenic
Formaldehyde	Cadmium
Hexane	Chromium
Propylene	Copper
Propylene oxide	Lead
Toluene	Mercury
Xylene	Nickel
	Silver
	Zinc

Emissions of toxic pollutants potentially associated with the facility were estimated using emission factors approved by the California Air Resources Board (CARB) and the U.S. Environmental Protection Agency (USEPA). Concentrations of these pollutants in air potentially associated with the emissions were estimated using dispersion modeling. Modeling allows the estimation of both short-term and long-term average concentrations in air for use in a risk assessment, accounting for site-specific terrain and meteorological conditions. Health risks potentially associated with the estimated concentrations of pollutants in air were characterized in terms of excess lifetime cancer risks (for carcinogenic substances), or comparison with reference exposure levels for noncancer health effects (for noncarcinogenic substances).

Health risks were evaluated for a hypothetical maximum exposed individual (MEI). The hypothetical MEI is an individual assumed to be located at the point where the highest concentrations of air pollutants associated with facility emissions are predicted to occur, based on air dispersion modeling. Human health risks associated with emissions from the proposed facility are unlikely to be higher at any other location than at the location of the MEI. If there is no significant impact associated with concentrations in air at the MEI location, it is unlikely that there would be significant impacts in any location in the vicinity of the facility.

Health risks potentially associated with concentrations of carcinogenic pollutants in air were calculated as estimated excess lifetime cancer risks. The excess lifetime cancer risk for a pollutant is estimated as the product of the concentration in air and a unit risk value. The unit risk value is defined as the estimated probability of a person contracting cancer as a result of constant exposure to an ambient concentration of 1 $\mu g/m^3$ over a 70-year lifetime. In other words, it represents the increased cancer risk associated with continuous exposure to a concentration in air over a 70-year lifetime. Evaluation of potential noncancer health effects from exposure to short-term and long-term concentrations in air was performed by comparing modeled concentrations in air with reference exposure levels (RELs). An REL is a concentration in air at or below which no adverse health effects are anticipated. RELs are based on the most sensitive adverse effects reported in the medical and toxicological literature. Potential noncancer effects were evaluated by calculating a ratio of the modeled concentration in air and the REL. This ratio is the hazard quotient. The unit risk values and RELs used to characterize health risks associated with modeled concentrations in air were obtained from the *Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines* (CAPCOA, 1993), and are presented in Table 8.6-4.

8.6.3.2.1 Toxic Air Pollutant Risks

The excess lifetime cancer risk associated with concentrations in air estimated for the MEI location is estimated to be 8×10^{-8}. Excess lifetime cancer risks less than 1×10^{-6} are unlikely to represent significant public health impacts that require additional controls of facility emissions. Risks higher than 1×10^{-6} may or may not be of concern, depending upon several factors. These include the conservatism of assumptions used in risk estimation, size of the potentially exposed population and toxicity of the risk-driving chemicals. Further description of the methodology used to calculate health risks associated with emissions to the air is presented in Appendix 8.1C. As described previously, human health risks associated with emissions from the proposed facility are unlikely to be higher at any other location than at the location of the MEI. If there is no significant impact associated with concentrations in air at the MEI location, it is unlikely that there would be significant impacts in any other location in the vicinity of the facility.

TABLE 8.6-4
Toxicity Values Used to Characterize Health Risks

Compound	Unit Risk Factor $(\mu g/m^3)^{-1}$	Chronic Reference Exposure Level ($\mu g/m^3$)	Acute Reference Exposure Level ($\mu g/m^3$)
Acetaldehyde	2.7E-06	9.00E+00	--
Acrolein	--	0.06	1.9E-01
Ammonia	--	200	3.2E+03
Arsenic	3.3E-03	5.10E-01	--
Benzene	2.9E-05	60	1.3E+03
1,3-Butadiene	1.7E-04	20	--
Cadmium	4.2E-03	0.02	--
Chromium VI	1.4E-01	2.00E-03	--
Copper	--		1.00E+02
Ethylbenzene	--	2000	--
Formaldehyde	6.0E-06	3.0E+00	9.4E+01
Hexane	--	7000	--
Lead	1.20E-05		--
Mercury	--	0.09	1.80E+00
Naphthalene	--	9	--
Nickel	2.60E-04	0.05	6.00E+00
Polycyclic aromatic hydrocarbons	1.1E-03 to 1.1E-05[a]	--	--
Propylene	--	3000	--
Propylene oxide	3.7E-06	3.00E+01	3.10E+03
Silver	--	--	--
Toluene	--	3.00E+02	3.7E+04
Xylene	--	7.00E+02	2.20E+03
Zinc	--	3.50E+01	--

Source: CAPCOA, 1993
[a] URF varies by compound. Individual compounds and URFs are listed in Appendix 8.1C, Table 8.1C-1.

The chronic noncancer hazard indices associated with concentrations in air estimated for the MEI location are 0.44, combined across all target organs. A noncancer hazard quotient less than one is unlikely to represent a significant impact to public health. The chronic noncancer hazard indices associated with non-inhalation exposure pathways was 3×10^{-6}, which is also well below one for all target organs. A noncancer REL is not available for lead. However, lead exposures are well below typical estimates of average daily exposures estimated for lead (ATSDR, 1996).

The acute noncancer hazard indices summed across all target organs was 0.35, and also fell below one for all target organs. A hazard quotient or hazard index less than one is unlikely to represent

significant impact to public health. Further description of the methodology used to calculate health risks associated with emissions to the air is presented in Appendix 8.1C. As described previously, human health risks associated with emissions from the proposed facility are unlikely to be higher at any other location than at the location of the MEI. If there is no significant impact associated with concentrations in air at the MEI location, it is unlikely that there would be significant impacts in any other location in the vicinity of the facility.

8.6.3.2.2 Characterization of Risks from Toxic Air Pollutants

The estimates of excess lifetime cancer risks, and noncancer risks associated with chronic or acute exposures, fall below thresholds used for regulating emissions of toxic pollutants to the air. Historically, exposure to any level of a carcinogen has been considered to have a finite risk of inducing cancer. In other words, there is no threshold for carcinogenicity. Since risks at low levels of exposure cannot be quantified directly by either animal or epidemiological studies, mathematical models have been used to extrapolate from high to low doses. This modeling procedure is designed to provide a highly conservative estimate of cancer risks based on the most sensitive species of laboratory animal for extrapolation to humans (i.e., the assumption being that man is as sensitive as the most sensitive animal species). Therefore, the true risk is not likely to be higher than risks estimated using unit risk factors and is most likely lower, and could even be zero (USEPA, 1986; USEPA, 1996).

An excess lifetime cancer risk of 1×10^{-6} is typically used as a threshold of significance for potential exposure to carcinogenic substances in air. The excess cancer risk level of 1×10^{-6} which has historically been judged to be an acceptable risk originates from efforts by the Food and Drug Administration (FDA) to use quantitative risk assessment for regulating carcinogens in food additives in light of the zero tolerance provision of the Delany Amendment (Hutt, 1985). The associated dose, known as a "virtually safe dose" (VSD) has become a standard used by many policy makers and the lay public for evaluating cancer risks. However, a recent study of regulatory actions pertaining to carcinogens found that an acceptable risk level can often be determined on a case-by-case basis. This analysis of 132 regulatory decisions, found that regulatory action was not taken to control estimated risks below 1×10^{-6} (one-in-one million), which are called *de minimis* risks. *De minimis* risks are historically considered risks of no regulatory concern. Chemical exposures with risks above 4×10^{-3} (four-in-ten thousand), called *de manifestis* risks were consistently regulated. *De manifestis* risks are typically risks of regulatory concern. The risks falling between these two extremes were regulated in some cases, but not in others (Travis et al, 1987).

The estimated lifetime cancer risks to the maximally exposed individual are less than 1×10^{-6}, and the aggregated cancer burden associated this risk level is less than one excess cancer case. These risk estimates were calculated using assumptions that are highly health conservative. Evaluation of the risks associated with the facility emissions should consider that the conservatism in the assumptions and methods used in risk estimation considerably overstate the risks from facility emissions. Based on the results of this risk assessment, there are no significant public health impacts anticipated from emissions of toxic pollutant to the air from the proposed facility.

8.6.3.3 Hazardous Materials

Hazardous materials will be used and stored at the facility. The hazardous materials stored in significant quantities on-site and descriptions of their uses are presented in Section 8.12. Use of chemicals at the proposed facility will be in accordance with standard practices for storage and management of hazardous materials. Normal use of hazardous materials, therefore, will not pose significant impacts to public health. While mitigation measures will be in place to prevent releases, accidental releases that migrate offsite could result in potential impacts to the public.

The California Health and Safety Code Sections 25531 to 25541 and Code of Federal Regulations (CFR) Title 40 Part 68 under the Clean Air Act establish emergency response planning requirements for

acutely hazardous materials. These regulations require preparation of a Risk Management Plan (RMP), which is a comprehensive program to identify hazards and predict the areas that may be affected by a release of an acutely hazardous material (AHM). AHMs to be used at the facility include aqueous ammonia as discussed in Section 8.12. Aqueous ammonia may generate hazardous gases that could migrate offsite when released.

A vulnerability analysis will be performed during the Application for Certification (AFC) process to assess potential risks to humans at various distances from the site if a spill or rupture of the aqueous ammonia storage tank were to occur.

8.6.3.4 Operation Odors

Small amounts of ammonia used to control oxides of nitrogen (NO_x) emissions may escape up the exhaust stack but would not produce operational odors. The expected exhaust gas ammonia concentration, known as ammonia "slip," will be less than 10 parts per million (ppm). After mixing with the atmosphere, the concentration at ground level will be far below the detectable odor threshold of 5 ppm that the Compressed Gas Association has determined to be acceptable. Therefore, potential ammonia emissions are not expected to create objectionable odors. Other combustion contaminants are not present at concentrations that could produce objectionable odors.

8.6.4 Mitigation Measures

8.6.4.1 Criteria Pollutants

Emissions of criteria pollutants will be minimized by applying Best Available Control Technology (BACT) to the facility. BACT for the combustion turbine includes the combustion of natural gas.

The proposed project location is in an area that is designated by the state as nonattainment for ozone and particulate matter (PM). Therefore, all increases in emissions of NO_x, volatile organic compound (VOC), particulate matter with an aerodynamic diameter less than a nominal 10 micrometers (PM_{10}), and sulfur oxides (SO_x) must be fully offset if emissions exceed specified trigger limits. The combination of using BACT and providing emission offsets as needed will result in no net increase in criteria pollutants. Therefore, further mitigation of emissions are not required to protect public health.

8.6.3.2 Toxic Pollutants

Emissions of toxic pollutants to the air will be minimized through the use of natural gas as the only fuel at the proposed facility.

8.6.3.3 Hazardous Materials

Mitigation measures for hazardous materials are presented below and discussed in more detail in Section 8.12. Potential public health impacts from the use of hazardous materials are only expected to occur as a result of an accidental release. The plant has many safety features designed to prevent and minimize impacts from the use and accidental release of hazardous materials. The CVEC will include the following design features:

- Curbs, berms, and/or concrete pits will be provided where accidental release of chemicals may occur.
- A fire protection system will be included to detect, alarm, and suppress a fire, in accordance with the applicable laws, ordinances, regulations, and standards (LORS).
- Construction of the aqueous ammonia storage system will be in accordance with applicable LORS.

A Risk Management Plan (RMP) for the facility will be prepared prior to commencement of facility operations. The RMP will estimate the risk presented by handling ammonia at the facility. The RMP will include a hazard analysis, off-site consequence analysis, seismic assessment, emergency response plan, and training procedures. The RMP process will accurately identify and propose adequate mitigation measures to reduce the risk to the lowest possible level.

A safety program will be implemented and will include safety training programs for contractors and operations personnel, including instructions on 1) the proper use of personal protective equipment, 2) safety operating procedures, 3) fire safety, and 4) emergency response actions. The safety program will also include programs on safely operating and maintaining systems that use hazardous materials. Emergency procedures for CVEC personnel include power plant evacuation, hazardous material spill cleanup, fire prevention, and emergency response.

Areas subject to potential leaks of hazardous materials will be paved and bermed. Incompatible materials will be stored in separate containment areas. Containment areas will be drained to either an oily waste collection sump or to the wastewater neutralization tank. Also, piping and tanks exposed to potential traffic hazards will be additionally protected by traffic barriers.

8.6.5 References

ATSDR. 1996. *Toxicological Profile for Lead. Update.* Agency for Toxic Substances and Disease Registry.

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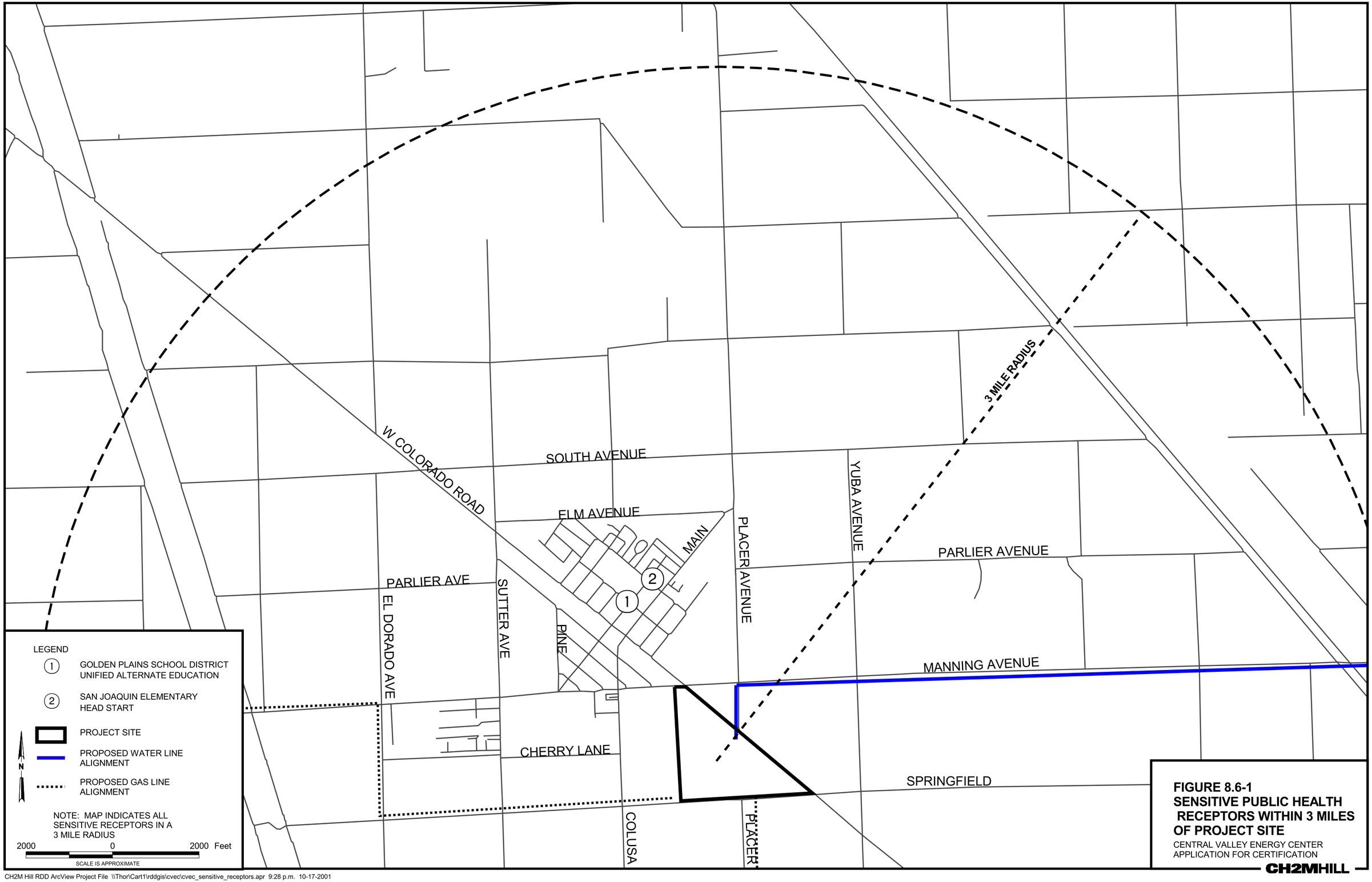

FIGURE 8.6-1
SENSITIVE PUBLIC HEALTH RECEPTORS WITHIN 3 MILES OF PROJECT SITE
CENTRAL VALLEY ENERGY CENTER
APPLICATION FOR CERTIFICATION

CH2MHILL

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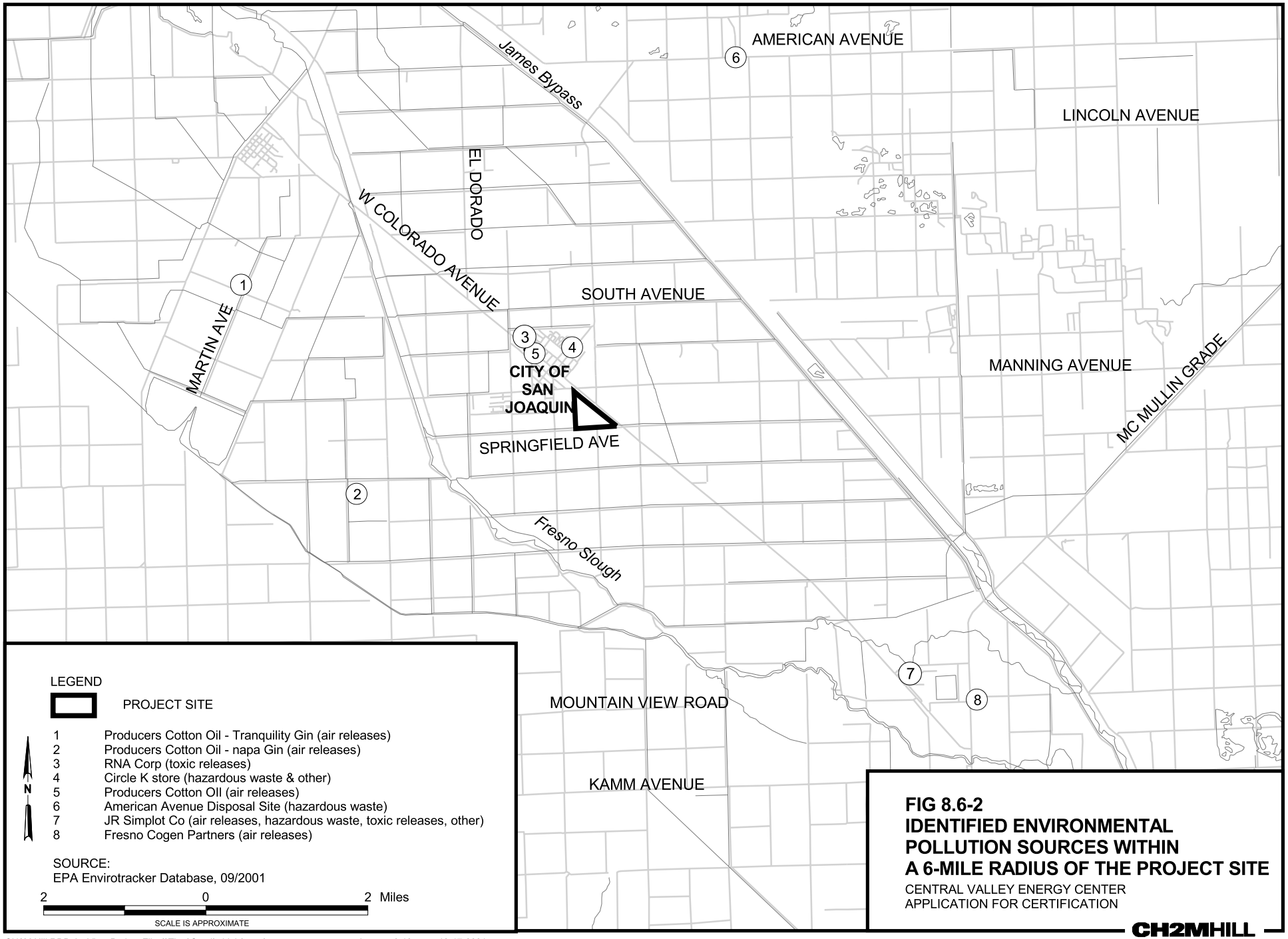

FIG 8.6-2
IDENTIFIED ENVIRONMENTAL POLLUTION SOURCES WITHIN A 6-MILE RADIUS OF THE PROJECT SITE

CENTRAL VALLEY ENERGY CENTER
APPLICATION FOR CERTIFICATION

CH2MHILL

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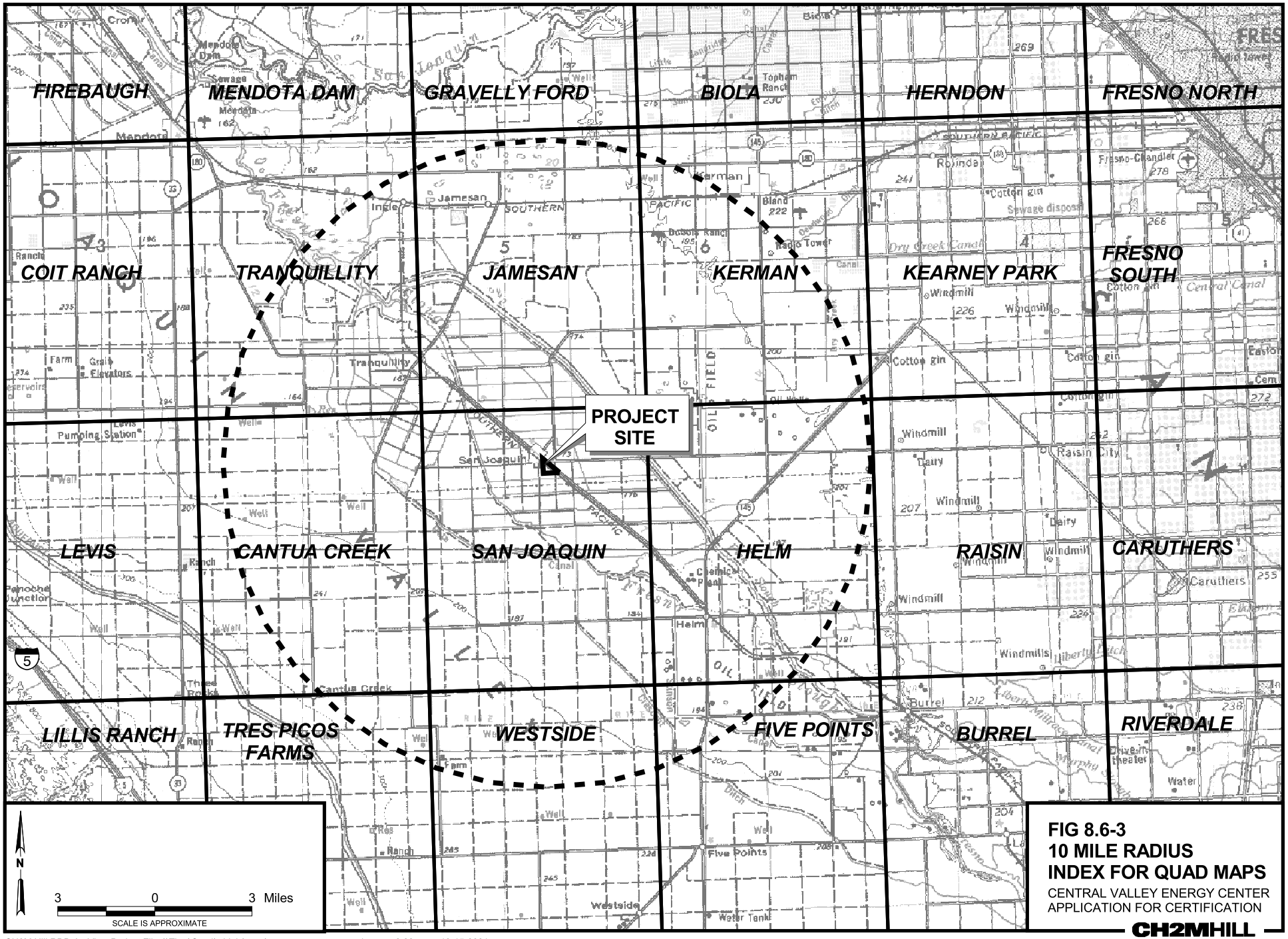

FIG 8.6-3
10 MILE RADIUS
INDEX FOR QUAD MAPS

CENTRAL VALLEY ENERGY CENTER
APPLICATION FOR CERTIFICATION

CH2MHILL

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